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**NOTES ON THE SPECIES OF AMATHES Hbn.**

BY JOHN B. SMITH, SC.D.

(Plates IX-X.)

Under the term *Orthosia* Ochs. we have long had in our lists a number of species which divided normally into two groups or series. One of these was robust, large, heavily built, with quadrate thorax like *helva* Grt. The other was much slighter, smaller, with smoother, convex thorax like *ferruginoides* Gn. That these could not remain united has been recognized; but partly because of lack of material and partly because there was doubt as to the identity of some species, matters have been left as they were. In his vol. vi, Sir George F. Hampson unites the slighter species of our "*Orthosia*" with the genus *Amathes* Hbn., and makes it possible to identify and place all our species.

As thus defined *Amathes* Hbn. has the "Proboscis fully developed; palpi obliquely porrect, fringed with long hair in front, the 3rd joint short; frons smooth; eyes large, rounded; antennæ of male typically ciliated; head and thorax clothed with hair only; the tegulæ produced to a dorsal ridge, the pro- and metathorax without distinct crests; abdomen dorsally flattened, with lateral tufts of hair and some rough hair at base but without crests. Forewings with the termen evenly curved." The eyes are naked and the legs are without spinulation or other armature save the normal spurs. As a minor character it may be noted that in all the species the reniform is dusky filled inferiorly.

Within this genus are three sections, two of which contain American species: Section II with antennæ of male minutely serrate, with fasciculate cilia, and Section III with male antennæ ciliate only.

Section I contains no recognized North American species.

Section II contains two species only, both belonging in the series in which the antemedial or t. a. line of primaries is single, and the costal area of the secondaries is pale. *Verberata* is said to have the "frons black at sides," while *bicolorago* is one of those having the "frons concolorous at sides."

Section III contains all the rest of our species, and the table, modified to contain only those forms, reads as follows:

- C. Hind wing fuscous, with the veins reddish.....**immaculata.**
- D. Hind wings grayish, more or less tinged with fuscous, and with diffused dark subterminal band.
  - a. Forewing with a black bar from costa at subterminal line...**purpurea.**
  - b. Forewing without black bar from costa at subterminal line.
    - a1. Forewing with the orbicular figure—of—8-shaped.....**americana.**
    - b1. Forewing with the orbicular quadrate, open above.....**puta.**
- E. Hind wings yellowish-white.
  - a. Forewing with series of small black spots on inner side of subterminal line.....**ralla.**
  - b. Forewing without series of small black spots on inner side of subterminal line.
    - a1. Forewing with the markings dark brown.....**inops.**
    - b1. Forewing with the markings pale rufous.....**decipiens.**

Of these species *immaculata* Morr. and *americana* Morr. are autoptically unknown to Sir George. The type of *americana* is in the Tepper collection, and is a poor example of the European *lota*; the type of *immaculata* has disappeared. It should be in the collection at Cambridge according to the statement in Morrison's description; but it is not now to be found, and there is no record of what has become of it. The description leaves a doubt as to whether the species really belongs here.

In arranging the material in my collection it became obvious that there were several new forms involved, and these were characterized as preliminary to a more careful study of some of the structural characters of the series.

On both structure and maculation three series are obvious in the genus, and they are not even closely related, although for convenience they may be held together for the present under one generic name.

The first series is the equivalent of Hampson's Section II, with the male antennæ minutely serrate and fasciculate. This serration is variable in the species, never very strongly marked, and the fasciculation is as diverse, leaving a very small margin between the series I, and some forms of series II. However, in addition to this antennal character, all the species have trigonate primaries with arched costa, distinct apices and obliquely arcuate primaries on which the s. t. line is continuous and preceded by a darker shading; characters which are obvious in both sexes.

The males of all the species further agree in genitalic structure. The supra-anal plate is of the usual triangular form, and the uncus is a long, simple curved hook of the usual type. The harpes are elongate, of moderate width, and drawn to a rather long point. Along the upper margin they are thickened, and at or behind the middle the corneous clasper is attached. This clasper is rather short, stout, and divided into two forks or branches of which the interior is somewhat hood-like, with a serrate extremity, while the exterior, lying next to the harpes, is more or less spatulate, drawn out and flattened. Within the limits of this series the agreement is close and the species form a thoroughly natural little group.

*Verberata* Smith is the darkest, and, in a way, the best marked species. The ground color is a sordid luteous, more or less tinged with reddish, mottled and blotched with smoky, and with a very conspicuous, angulated median shade. The dull smoky secondaries with broad costal and narrow exterior yellow margins are alike in both sexes. The black color at sides of front noted by Sir George Hampson is really only a small margin in front of the eyes; but it is present and is characteristic.

*Bicolorago* Guenée, with its more usual form *ferruginoides* Gn., has a much lighter, more rusty yellowish ground color, the wings seeming altogether more thinly scaled. The maculation is all broken up and the shadings are purplish. The tendency is to darken the entire outer half of the wing; the extreme is this direction being the typical though rather more exceptional *bicolorago*, while the more common type in which the shadings are reduced to the broken up lines is *ferruginoides*. The median shade is rarely conspicuous in itself, and is not strongly angulated over the inferior half of the reniform. The secondaries are very like those of *verberata*, except that they seem more thinly scaled and the light color is paler, more reddish throughout. This is, perhaps, the most common and widely distributed species of the genus.

*Decipiens* Grote looks like a large, washed out *ferruginoides* with yellow secondaries. The primaries are without contrasts of any kind, and the maculation is traceable merely.

*Acta* Smith is a bright species, in which the secondaries are uniformly bright lustrous yellow, almost transparent. The primaries are a little darker in ground color and are marked and mottled with brick-red; sometimes approaching the appearance of *ferruginoides*.

All the markings are distinct, and the median shade, which tends to become prominent, is very much like that of *verberata* in course.

*Straminea* Smith is a small species, straw-yellow in appearance, with all the maculation present but not conspicuous. The s. t. space is somewhat darkened by a smoky shading and the reniform is dusky inferiorly, as usual. The secondaries, while they are pale, are dull, with a smoky tinge, and there is a darker outer border.

The second series, with the antennæ of the male ciliate only, is the equivalent of Hampson's Section III; but this contains two series more widely distinct than the difference between the series distinguished on the antennal character alone.

Superficially all of these species, except *inops*, differ from all the preceding in that they have a punctiform s. t. line; and in general that line is preceded on the costa by a distinctly darker patch filling the s. t. space at that point. But that is a somewhat variable character, and while in the series it stands out conspicuously in each species, yet individuals occur in all of them in which the point is obscured.

A series of three species, *antapica*, *purpurea* and *fornica* have the primaries somewhat elongate, with acute apices, even or slightly depressed costa and the outer margin a little excised below the apex. There is a tendency to the darkening of the s. t. space, and the terminal space is concolorous or even a trifle paler.

The sexual characters of the male agree remarkably in the form of harpes and clasper. Only in *purpurea* were the supra-anal plate and uncus examined, and in that species the latter is broad and flattened, altogether unlike the slender hook of the species in the preceding series. The harpes in all the species are narrow, elongate, drawn out to a long point; not so markedly unlike the *bicolorago* type, but even narrower with a longer point. The superior margin of the harpes is thickened at base and to the middle, and then the chitinous thickening extends obliquely across to the inferior margin and may extend almost or quite to the tip. From the oblique thickening and almost at the middle of the part a rather stout, moderately long, curved hook arises, which becomes more slender toward the tip, but ends bluntly. Only in *antapica* does this hook seem to be absent; but I believe that to be due to defective material rather than to a real divergence from its allies. Toward the apex and a little nearer the inferior margin is a chitinous, short, stout,

slightly curved or straight tooth, claw or hook, characteristic for each species, and this is on the line of the oblique chitinous ridge already described.

*Antapica* Smith is a large, rough, powdery brown species; dull throughout and with smoky, dark secondaries; the costal region paler, however. All the maculation is distinct in this species, the median shade is strongly angulated and distinct, and in almost every case the costal dark patch in the s. t. space is well defined. The excision below apex of primaries is not prominent, nor is that on the secondaries very strongly marked; but the former is at least readily made out and the latter is obvious. The dark filled reniform is unusually conspicuous in this species.

*Purpurea* Grote varies from reddish brown, often with a smoky suffusion to creamy luteous; the latter being the variety *crispa* of Harvey. This is the largest of the species and the wing form is most characteristic. The depression of the costal margin of primaries is evident, the apex is almost subfalcate in some examples, and the excision on the outer margin of secondaries is well marked. The surface tint is quite even whatever its color, and while all the markings are present they are not conspicuous. In dark specimens the lines are paler filled, and the veins through the outer part of the wing are pale marked. The s. t. line is pale, continuous, accompanied by a series of black interspaceal dots. In dark examples the pale line is conspicuous and the dots are lost, while in pale individuals the line is scarcely noticeable and only the dots appear to represent it. The secondaries are dusky, the costal margin somewhat paler, and they vary in tint much as do the primaries.

*Fornica* Smith is a decidedly smaller species tending to brick-red in color, in which the characteristic wing form is hardly obvious, while the agreement in maculation and in essential structure is well marked. The markings are all present but not prominent; and the most conspicuous feature is the dark mark on the costa preceding the s. t. line. The secondaries are pale, transparent reddish, with a smoky clouding, which forms an outer band and discal spot. The s. t. line consists of a series of neat, small, interspaceal dots, without traces of an accompanying line.

The remainder of the species, excluding *inops*, differ from all the preceding species by having the uncus in the male furcate, or divided into two divaricate prongs. These prongs are as long as the

single hook of the *bicolorago* series, and the structure is constant and not confined to this series of species only. The species as a whole are slighter bodied than those of the preceding series; but the differences are so slight that it is difficult to draw the line. The costa of primaries is always arched, and generally the inner margin as well; but *aggressa*, in wing form, is very like *antapica*, except that on the secondaries there is a mere trace of the subapical excision. The harpes of the males vary quite a little; that of *aggressa* resembling the preceding series quite nearly, while that of *ralla* has a series of spinules on the inner side of the tip. All the species agree in having as clasper a long, slender or moderate curved hook.

*Aggressa* Smith is the palest of the species, and in wing form most like those of the previous series. In fact, taking only the first, superficial impression as controlling, its reference as an ally of *purpurea* is the most natural. It is the palest in color of all the species, and in the terminal space in some examples there is a distinct wash of whitish. The median shade is especially well marked and is nearer to a real band than in any other of the species. The secondaries are dirty gray or even whitish, and, altogether, this is a well defined form. The harpes of the male are drawn to a blunt point from the inferior margin, and there is no spinulation at tip, though there are isolated long bristles at the margin. The clasper is moderate in length, stout, well curved, with a blunt tip.

*Euroa* Grote is a distinctly redder gray to brownish form, with shorter primaries, which have in the male always, and in the female usually, arched costal and inner margins. In some of the females the reddish-gray predominates, all the maculation is well written, and the appearance is very like that of the preceding species, save for the tendency to a dark terminal space and the reddish shade. In the males this narrow winged paler form does not appear to occur, and there is no difficulty in recognizing it. The secondaries are dirty whitish to smoky, with a pinkish or faint reddish tinge. In the male the harpes are shorter and broader than in its allies, the tip more obtuse and the margins set with longer, stiff bristles. The clasper is very long, more slender than in any other species, and well curved.

*Duscata* Smith looks at first sight like a smaller, darker *euroa*, in which there is a tendency to a blackish shading; and with males of *euroa* only at hand for superficial comparison, that conclusion would

be justified. But with a series of both sexes for comparison, the difference between the two species becomes obvious. *Duscata* is uniformly smaller, more brown in ground, and more suffused with blackish. The primaries are shorter, broader, and similar in the sexes; the outer margin with not a trace of an incurve below the apex. In the primary characters of the male the difference is emphasized. The harpes are much longer and narrower than in *euroa*, and at the tip there is a small series of spinules directed inwardly. The clasper is shorter and stouter than in *euroa*, but yet of good length and moderately curved.

*Ralla* Grote and Robinson differs from the others of this series in its rusty yellow color and general resemblance to *ferruginoides*. The shorter, broader primaries and the punctiform s. t. line will differentiate it at once, however, when the male characters cannot be referred to. The uniform yellow secondaries give it a nearer appearance to *acta*, which is of another faunal region. In the male structures this species departs a little from the other species in this series by the oblique fringe of spinules at the tip of the moderately elongate harpes. The clasper is the same curved hook, but shorter, and on the whole stouter in appearance.

*Inops* Grote is altogether out of place here; but my material is too scant to work out its affinities at present. It resembles a small *ralla* in color and wing form, but has the s. t. line continuous, preceded by a dusky shading, much more even than in the first series. In the genitalia of the male it is different in all points from the other species referred here. As to the uncus I cannot speak, because I have had no material of my own available for dissection. In the harpes we have a composite structure, the clasper being not really separated from it. A horny plate runs through the lower half of the harpes from basal third to the inferior angle at tip, and there it is produced into an irregular serrate process. At about the middle of this plate there is a small, cylindrical, obtusely terminated spur.

There are at least two other allied, undescribed species in collections, but in single specimens and in no condition to form satisfactory types.

As to the species here noted they may be arranged in tabular form as follows :



Antennæ of male serrate and bristle tufted.

Secondaries smoky or dusky in both sexes.

Front black at sides; primaries luteous to reddish; median shade distinctly angulated; transverse maculation well written.....**verberata**.

Front concolorous at sides; primaries rusty yellowish, very powdery; median shade upright; transverse markings broken.....**bicolorago**.

Secondaries yellow or pale in both sexes.

All the maculation obscure; yellowish-red; median shade not conspicuous; size large.....**decipiens**.

All the maculation distinct, well written; yellowish, with brick-red powderings; median shade conspicuous; size moderate.....**acta**.

All maculation traceable only; color straw-yellow; size small.

**straminea**.

Antennæ of male ciliate only.

Costa of primaries a little depressed at or beyond the middle; apex distinct, outer margin a little excised beneath it; inner margin straight or nearly so; the wing elongate.

Ground color of primaries rough, powdery; median shade conspicuous.

Luteous to rusty brown; secondaries smoky brown; size larger.

**antapica**.

Ground color of primaries even, not powdery; median shade not conspicuous.

Creamy to dark gray-brown; secondaries dusky; excision below apex in both wings well marked.....**purpurea**.

Reddish to red-brown; secondaries pale, with a glistening reddish tinge; excision below apex in both wings feebly marked.....**fornica**.

Costa and usually the inner margin of primaries arched; outer margin not excised below apex.

S. t. line punctiform.

Gray, brown or red, with dusky powderings and washes.

Pale, creamy gray, with smoky markings; primaries in both sexes narrow.....**aggressa**.

Brown-red, less powdery; primaries narrower in the female....**euroa**.

Smaller, darker, more powdery; primaries more obtuse in both sexes.

**duscata**.

Rusty yellowish, with purplish powderings; maculation broken..**ralla**.

S. t. line continuous.

Rusty yellowish, rather even in tint; the maculation inconspicuous.

**inops**.

### **Amathes verberata** Smith.

1904. Smith, Can. Ent., xxxvi, 153, *Orthosia*.

1905. Dod, Can. Ent., xxxvii, 246, *Orthosia*.

1906. Hamps., Cat. Phal. B. M., Noct., vi, 480, pl. 107, f. 1, *Amathes*.

The types were received from Mr. Dod, labelled "Head of Pine Creek, Calgary, Alberta," at various dates after the middle of September. Later, Mr. Dod records the capture of the species in June, from the same locality. Hampson adds Glenwood Springs, Colorado, to the distribution, and I now have specimens in my collection

from Kaslo, British Columbia, taken by Dr. Dyar; Victoria, Vancouver, September 9th, and Miniota, Manitoba, September 1st. There are only single examples from each locality, indicating that it is not exactly common; but they are all very much alike, indicating that there is no very great range in variation. There are several examples from Kaslo in the collection of the United States National Museum.

So far as examination has been made, the sexual tuftings of the male correspond closely with those described for *bicolorago*; but material for destructive study has not been available.

**Amathes bicolorago** Guenée.

- 1852. Gn., Spec. Gen., Noct., i, 397, *Xanthia*.
- 1874. Grt., Bull. Buff. Soc. Nat. Sci., iii, 124, var. *ferruginoides*.
- 1875. Morr., Proc. Ac. Nat. Sci. Phil., 1875, 66 = *ferruginoides*.
- 1893. Smith, Bull. 44, U. S. Nat. Mus., 218, *Orthosia*.
- 1898. Dyar, Proc. Ent. Soc. Wash., iv, 324, larva on maple.
- 1903. Holl., Moth Book, 217, pl. 26, f. 29, *Orthosia*.
- 1906. Hamps., Cat. Phal. B. M., Noct., vi, 481, pl. 107, f. 2, *Amathes*.  
*spurecata* Wlk.
- 1857. Wlk., Cat. Brit. Mus. Het., xi, 749, *Xanthia*.
- 1868. G. and R., Trans. Am. Ent. Soc., iii, 78, pr. syn.
- 1893. Smith, Bull. 44, U. S. Nat. Mus., 218, *Orthosia*.
- 1906. Hamps., Cat. Phal. B. M., Noct., vi, 481, pr. syn.  
var. *ferruginoides* Guenée.
- 1852. Gn., Spec. Gen., Noct., i, 398, *Xanthia ferruginea* var.
- 1868. Bethune, Can. Ent., i, 47 (49), *Xanthia*.
- 1874. Grt., Bull. Buff. Soc. Nat. Sci., ii, 124, *Orthosia*.
- 1875. Morr., Proc. Ac. Nat. Sci. Phil., 1875, 66, *Xanthia*.
- 1875. Speyer, Stett. Ent. Zeit., xxxvi, 119, *Orthosia*.
- 1893. Smith, Bull. 44, U. S. Nat. Mus., 218, an var. prec.
- 1906. Hamps., Cat. Phal. B. M., Noct., vi, 482, *Amathes*.  
*bicolorago* † Walker.
- 1856. Wlk., Cat. Brit. Mus., Het., x, 464, *Xanthia*.
- 1868. G. and R., Trans. Am. Ent. Soc., iii, 78, pr. syn.

In this species I have under examination a very interesting series of considerably over 200 examples. Besides my own collection, there are more than 70 examples from the U. S. National Museum, which are particularly useful because of the range of localities and because there is a series of seven bred specimens; there is also a series of about a dozen examples from the Museum of the Brooklyn Institute, showing extremes of variation; Mr. O. Buchholz has sent me a large number of examples, spread and unspread from Mani-

toba, which illustrate local range, and with the smaller contributions I have an excellent basis for a study of the species.

First of all, it should be said that the structure of the male genitalia is practically identical throughout. I have examined specimens of each type and from almost every locality, and a series of dry specimens from Cohasset, Mass., furnished a large lot of material which was softened in liquor potassa and from which the genital structures were then dissected out entire. In the corneous parts, clasper and uncus, there is absolutely no perceptible variation; in the harpes, or side pieces which are less chitinized, there occurs a very slight variation in details of outline; but so slight as to be unnoticeable, except on close comparison. The abdominal brush is also identical throughout.

In locality the specimens range from Maine to Texas, to the Mississippi Valley to South Dakota and to Manitoba. I have nothing from the Rocky Mountain region nor from the Pacific Coast. As to dates of capture, they begin in early September, extend through October, and a few examples are marked as taken in May, indicating a form that hibernates in the adult stage.

The range of size is unusual for a Noctuid: the smallest example expands 1.10 inches and is a ♂; the largest expands 1.50 inches and is a ♀, the largest ♂ reaching almost as much, or 1.48 inches.

In ground color the primaries may be anything from a pale luteous to coppery red-brown, and the secondaries range from uniform glistening reddish-yellow to black. Usually the primaries are more or less powdered with black scales; but sometimes they are almost uniform reddish brown, the other extreme coming in when all beyond the median line is black or blackish, making a typical *bicolorago*. In what may be considered the normal form of *ferruginoides*, the primaries are of a tolerably even rusty luteous, with blackish or darker brown powderings, which first become more noticeable over the median shade, making that broader and more diffuse, and then darken the s. t. space to the s. t. line which is thereby relieved and made more prominent. The terminal space is usually not quite so dark as the sub-terminal. As a rule the dark secondaries go with the dark primaries, and all the *bicolorago* that I have seen have the hind wings black. As the primaries become paler the secondaries follow, and a mottled forewing means, usually, a hindwing in which the disc is blackish. In the bred series from

the U. S. National Museum the primaries are in most cases quite uniform, but rather unusually intense brown, and the secondaries are blackish; but the palest specimen is paler throughout, and the only mottled example has the secondaries also mottled. I have attempted to determine whether locality had anything to do with the amount of mottling; but this seems not to be the case. Series caught at one time in one place are apt to be very similar; this is proved by the series from Manitoba, and by the material from Cohasset; but in the U.S. National Museum collection there are 28 examples from one general region in New York State, and the full range of variation is represented in this lot. Thirteen of these examples are from Mr. David Bruce, and while most of them are dark or strongly mottled forms, the more uniform red-brown forms are also represented.

Altogether this is an excellent example of a decidedly variable species, with two well-marked forms connected by a full series of intergrades. Typical *bicolorago* is rare; forms nearly immaculate are also rare; the mottled form in which there is a more or less diffuse median shade and a dusky subterminal space is by all odds the most common.

The large series of dry specimens from Cohasset, to which reference has been made, gave an excellent opportunity for studying the structure of the hair pencil which is attached to the base of the abdomen in the male. The first abdominal segment is dorsal only, and ends at the lateral line of the body where the front margin of the ventral portion of the second abdominal segment joins the thoracic structure. Attached just at the extreme outer edge of this second segment, where it joins the dorsal portion of the first segment is a long strip of chitin, broadening toward the lateral margin and from there produced into a long curved stalk, at the end of which is a round concavo convex disc-like structure. The curvature of this stalk is such that when at rest it lies close along the edge of the first segment. The under or concave side of this disc is set with pittings, and from the margins of these pittings comes a dense mass of very long fine hair, forming a slender pencil, almost half the length of the abdomen. This pencil normally fits into a membraneous pocket which is attached on the inner wall of the abdomen, reaching to the end of the fourth segment. The opening to this pocket is on the lateral line of the second and third segments,

that part of the pocket that lies inside the fourth segment having no opening to the face of the ring. This part is also somewhat curved and a little enlarged, to receive the folded up tip of the pencil. On the second abdominal segment, just above the edge of the slit opening into the pocket, is an elongate flap bordering a depression in which a portion of this pencil lies folded up, and acting as a cover and protector to it. That part of the pencil beneath this flap is quite apt to be darker in color than the rest of it.

Covering the sensory disc, the pedicel and the base of the pencil, is a delicate, elastic membrane, attached for the greatest part to the first abdominal segment and serving as a complete covering to the structure while it lies at rest.

The species is sometimes common locally, and the larva, according to Dr. Dyar, feeds on maple.

**Amathes decipiens** Grote.

1881. Grt., Bull. U. S. Geol. Surv., vi, 269, *Orthosia*.

1906. Hamps., Cat. Phal. B. M., Noct., vi, 491, pl. 107, f. 10, *Amathes*.

Mr. Grote's type was a female from Northern Indiana, taken in June, and that is the only example now in the British Museum. Hampson was therefore compelled to place the species in the section in which the male had the antennæ ciliate only, by guess. The occurrence of a good male shows a close ally of *bicolorago*, and, indeed, Mr. Grote's comparison with that species or its variety *ferruginoides*, is justified throughout.

A specimen in my own collection is from Elizabeth, New Jersey, taken October 19th, by Mr. S. T. Kemp. I have seen, altogether, only four examples of this species, so it can scarcely be considered common in a territory which is fairly well collected over.

**Amathes acta** Smith.

1907. Smith, Trans. Am. Ent. Soc., xxxiii, 133, *Orthosia*.

My examples are from Corvalis, Oregon, September to November; Livingston and Corfield, Vancouver, in September; and Pullman, Washington, in October. The species is therefore of the Northern Pacific Coast area, and will probably occur throughout that general region. The species varies a little in depth of color, and it is not improbable that examples of it are in collections as pale forms of *ferruginoides*. Examples are in at least two other collections that I have seen.

**Amathes straminea** Smith.

1907. Smith, Trans. Am. Ent. Soc., xxxiii, 132, *Orthosia*.

The original description and the preceding notes tell practically all that I know of this species. I have only two males, both from Colorado; the type, a fairly good example from Glenwood Springs, in October; the other a decidedly rubbed specimen without date or other information. I am not aware that I have seen others in collections that I have recently looked over.

**Amathes antapica** Smith.

1907. Smith, Trans. Am. Ent. Soc., xxxiii, 134, *Orthosia*.

This is a very distinct and characteristic species, probably not uncommon and with a considerable range of variation. I have it from Corvallis, Oregon; Pullman, Washington; and Corfield, Vancouver; the dates ranging from the end of September to the middle of November. It is an ally of the *crispa* form of *purpurea*; but altogether a rougher more coarsely powdery species. The range of distribution is like that of *acta*, and the difference between the punctiform s. t. line of this species as compared to the continuous line of *acta* is almost like that obtaining in the east between *ferruginoides* and *ralla*.

**Amathes purpurea** Grote.

1874. Grt., Bull. Buff. Soc. Nat. Sci., ii, 125, *Orthosia*.

1898. Dyar, Proc. Ent. Soc. Wash., iv, 323, larva.

1904. Dyar, Proc. U. S. Nat. Mus., xxvii, 873, larva.

1906. Hamps., Cat. Phal. B. M., Noct., vi, 489, pl. 107, f. 6, *Amathes*.  
var. *crispa* Harv.

1875. Harv., Bull. Buff. Soc. Nat. Sci., ii, 276, *Orthosia*.

1881. Butler, Papilio, i, 169, *Orthosia*.

1893. Smith, Bull. 44, U. S. Nat. Mus., 217, pr. var.

1906. Hamps., Cat. Phal. B. M., Noct., vi, 489, ab. prec.

The base of my knowledge of this species is a nice series of specimens in the collection of the U. S. National Museum, in which both the *purpurea* and *crispa* forms are represented. The range of variation is considerable, and greater than is indicated in the original types of the species; but I believe Sir George Hampson has extended it to include the species that I have separated off as *antapica*. In the catalogue above cited, the localities Vancouver and Oregon almost undoubtedly apply to *antapica*, while the California localities only are really applicable to *purpurea* and are from the type examples. I have no doubt whatever of the distinctness of the two spe-

cies that I have separated here, and from the material known to me and from the general run of geographical distribution I doubt whether the true *purpurea* or *crispa* occur in the Vancouver faunal area and that *antapica* runs down to Sauzalito.

A comparison of the figures of the ♂ genitalia will show at once sufficient differences not due to variability, to enhance the superficial characters referred to. Not only are the harpes materially different in outline; but the form of the small accessory clasper is altogether different in the two species.

Dr. Dyar has bred this species and has described the larva from Alameda Co., California, as feeding on hollyhock and plantain.

Except this, only the type localities are known and the dates are October and November.

***Amathes fornica* Smith.**

1907. Smith, Trans. Am. Ent. Soc., xxxiii, 134, *Orthosia*.

I have only a single example of this species. Fortunately it is a male and in good condition, so that its relationships are apparent. It is tagged with the old "S. Cal." locality label, and I have absolutely no present guide as to its original source. It has evidently been respread since I had it, and if it ever had any distinctive label it has disappeared. In appearance and color it is much closer to *antapica* than to *purpurea*, but is smaller, smoother and more neatly marked. In genital structure the relation to *antapica* is equally clear and the difference is rather in details than in character. I do not consider it beyond the bounds of probability that this is a dwarfed aberrant *antapica* with an erroneous locality; but I do not believe it to be so.

***Amathes aggressa* Smith.**

1907. Smith, Trans. Am. Ent. Soc., xxxiii, 135, *Orthosia*.

This looks not unlike a faded *eurora* and is probably in collections under that name. I have it from Cartwright, Manitoba, without date, taken by Mr. Heath; from Chimney Gulch near Denver, Colorado, in July, taken by Mr. Osler, and from Clear Creek Canon, Colorado, in August, through Dr. Barnes. The wing form is almost elongate enough to justify association with *purpurea*; but the fascies which is so easily recognized and so difficult to describe suggests *euroa* even more strongly, and that is borne out by the genital structure, which has been already described.

**Amathes euroa** G. and R.

1873. G. and R., Trans. Am. Ent. Soc., iv, 431, *Xanthia*.  
 1893. Smith, Bull. 44, U. S. Nat. Mus., 218, *Orthosia*.  
*puta* || G. and R.  
 1868. G. and R., Trans. Am. Ent. Soc., i, 347, pl. 7, f. 50, *Xanthia*.  
 1873. G. and R., Trans. Am. Ent. Soc., iv, 431, n. b. 1.  
 1906. Hamps., Cat. Phal. B. M., Noct., vi, 490, pl. 107, f. 7, *Amathes*.

Hampson uses the term *puta* for this species, and does not recognize the change made by Grote and Robinson because their term first proposed was pre-occupied. If *puta* was actually a *nomen bis lectum* in *Xanthia* when proposed, irrespective of whether it was actually congeneric with the pre-existing *puta*, the authors had a right to change the specific name, and having properly done so they must be followed, even though the two *puta* prove later to be generically separable.

In the series before me there is a curious dimorphism in the females; some of them have the wing form of the male and resemble it closely in maculation; others differ in having the primaries distinctly longer and much more definitely marked, the median shade especially being very well defined and obviously angulated. It really looks very much like *aggressa*. I have never seen a male of this form and it seems locally so uniformly associated with the normal male of *euroa* that I can scarcely believe it distinct. The character used by Hampson in his table, *i. e.*, the quadrate orbicular open to the costa is not constant, a closed oval being about as frequently present as the open quadrate form. I have had the specimens from Mrs. C. H. Fernald's collection, from the collection of the U. S. Nat. Mus., from the Museum of the Brooklyn Institute, and have examined those in the Amer. Mus. of Natural History.

Localities are St. Catherines, Ontario; Kittery Point and Orono, Maine; Buffalo, Centre and Sharon, New York. Dates range from the middle of August to the middle of September.

Other recorded localities cover the eastern United States west to the Mississippi and southwest to the District of Columbia. Colorado is also included, but that may be based on what I have separated as *aggressa*; and Calgary, Alberta, given by Hampson, almost certainly refers to my *duscata*. Though so widely distributed, I have never known the species to be common, and it is distinctly northern in range, more examples in collections coming from "Maine" than from any other one locality.

The sexual characteristics are elsewhere described.



**Amathes duscata** Smith.

1907. Smith, Ann. N. Y. Ac. Sci., p. —, *Orthosia*.

I have quite a series of specimens from various localities in Manitoba—Brandon, Miniota, Winnipeg, Cartwright—and there are many more in other collections under the name *euroa*. For the latter determination I am responsible in most cases, because until I had sufficient material to compare series, I believed this form to be at most a local race.

Dates of capture are June, August, September and October, and a question remains whether the adult hibernates as is usual in this genus, or whether there are two broods as indicated by the months given. The period of flight is unusual for a member of this genus.

The genital structure has been sufficiently described elsewhere, and the points in which the species differs from its allies have been brought out.

**Amathes ralla** Grote and Robinson.

1868. G. and R., Trans. Am. Ent. Soc., i, 346, pl. 7, f. 49, *Xanthia*.

1874. Morr., Proc. Acad. Nat. Sci. Phil., 1874, 66 = *ferruginoides*.

1875. Morr., Can. Ent., vii, 78 = *ferruginoides*.

1875. Lint., Can. Ent., vii, 78, *an bona species*.

1893. Smith, Bull. 44, U. S. Nat. Mus., 217, *Orthosia*.

1906. Hamp., Cat. Phal. B. M. Noct., vi, 490, pl. 107, f. 8, *Amathes*.

Differs obviously from all the other species in the series in the rusty yellow colors of thorax and primaries which gives it that casual resemblance to *ferruginoides* that led Mr. Morrison and some others to claim that it was merely a varietal form.

The characters of maculation, color and male genital structure have been already set out, and in the series before me there is very little variation.

General localities are the eastern and Middle United States; my own examples are from Claremont, N. H., September 2d; Cohasset, Mass., August 13th (Bryant); "New York;" New Brighton, Pa., September 1st (Merrick); Cranberry, North Carolina, in August; the latter example from either Laurent or Wenzel.

**Orthosia inops** Grt.

1881. Grt., Bull. U. S. Geol. Surv., vi, 270, *Orthosia*.

1906. Hamp., Cat. Phal. B. M. Noct., vi, 490, pl. 107, f. 9, *Amathes*.

This the most local of all the species known to me, all the examples that I have seen having been taken by Dr. R. Thaxter at Kittery Point, Maine, in September. One example to a collection seems to be the rule, except at Cambridge, where there are several in the Thaxter material.

Unfortunately I have not had a male specimen of my own for dissection; such studies as I have been able to make show a genitalic structure utterly out of line with any other species in the genus.

There are in collections a number of examples allied to *inops*, and it may be that some are really forms of that species; but all the specimens—one of them in my own collection—are too poor to serve as safe bases for new names.

*Orthosia americana* Morr., has been already referred to *O. lota* of Europe, and is without much doubt based on a European example. To the courtesy of Prof. R. H. Pettit I owe an opportunity of again examining the type, and after comparing it carefully with authentic examples of *loti*, I do not hesitate to declare it the same.

In 1875, and for some years before and after, there lived in Hoboken, New Jersey, an old collector who had remarkable success in capturing species that no one else seemed to be able to find. For a consideration he was usually willing to part with some of his prizes, and so, gradually, there came into collections a number of specimens without names, all credited to New Jersey, which remained as puzzles for a considerable time. As this collector lived in the outskirts of the city, had a large garden and had plenty of wood and scrub land near by, it was not considered strange that by diligent collecting he should capture more species than others not so well situated. And when in Sphingids and Bombycids it was found that many of his species were identical with European forms, that was not considered so strange either, because at that time there was a pretty general belief that many of the American species were really the same as those on the other side of the Atlantic. But when it was found that some butterflies purchased from him had been ingeniously stained and tinted, belief in his honesty was shaken, and when it was learned that no one else could find these European species in New Jersey, that label gradually disappeared from the examples or they were entirely discarded. Unfortunately Mr. Morrison got hold of a few of these "uniques" and straightway described them as new. Most of them have been eliminated ere this. A few still have a hold in our lists because direct comparisons have been for some reason impossible. *O. americana* must be omitted hereafter, to be cited only in the synonymy to *O. lota*.

*Orthosia immaculata* Morr. is included by Hampson with *Amathes*; but can hardly belong here. The description indicates a spe-

cies more like the *conradi* type, and the locality is out of range for any known species of this genus; which is of course no valid argument against such a form occurring there. I have been unable to get track of the type. It is not in the Cambridge Museum as Morrison states, and there is no record apparently, of its ever having been there. It may be that Mr. Morrison failed to return the example after describing it, and later disposed of it elsewhere. Until it turns up or until an insect from Nevada occurs which fills all the requirements of the description, the name must stand "unknown" in our collections.

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#### EXPLANATION OF PLATES.

##### PLATE IX.

Fig. 1.—*Orthosia crispa*, genitalic structure of male from beneath, with harpe and clasper of one side removed; uncus spatulate.

" 2.—*Orthosia ralla*, genitalic structure of male from beneath, uncus divided, the tips divaricate.

" 3.—*Xanthia flavago*, genitalic structure of male from beneath, with harpe and clasper of one side removed; uncus divided, the tips widely divaricate.

" 4.—*Orthosia ferruginoides*, abdomen of male from beneath showing hair pencils in position.

" 5.—*Orthosia ferruginoides*, part of the inner wall of male abdomen with muscular tissue removed to show the case in which the hair pencil is concealed.

" 6.—*Orthosia ferruginoides*, part of male abdomen from above, with hair pencil partly withdrawn from its case, showing also the openings on the second and third abdominal segments.

" 7.—*Orthosia ferruginoides*, the hair pencil and its pedicel fully separated from the male abdomen.

" 8.—*Orthosia ferruginoides*, disc of the pedicel to which the hair of pencil is attached: very greatly enlarged.

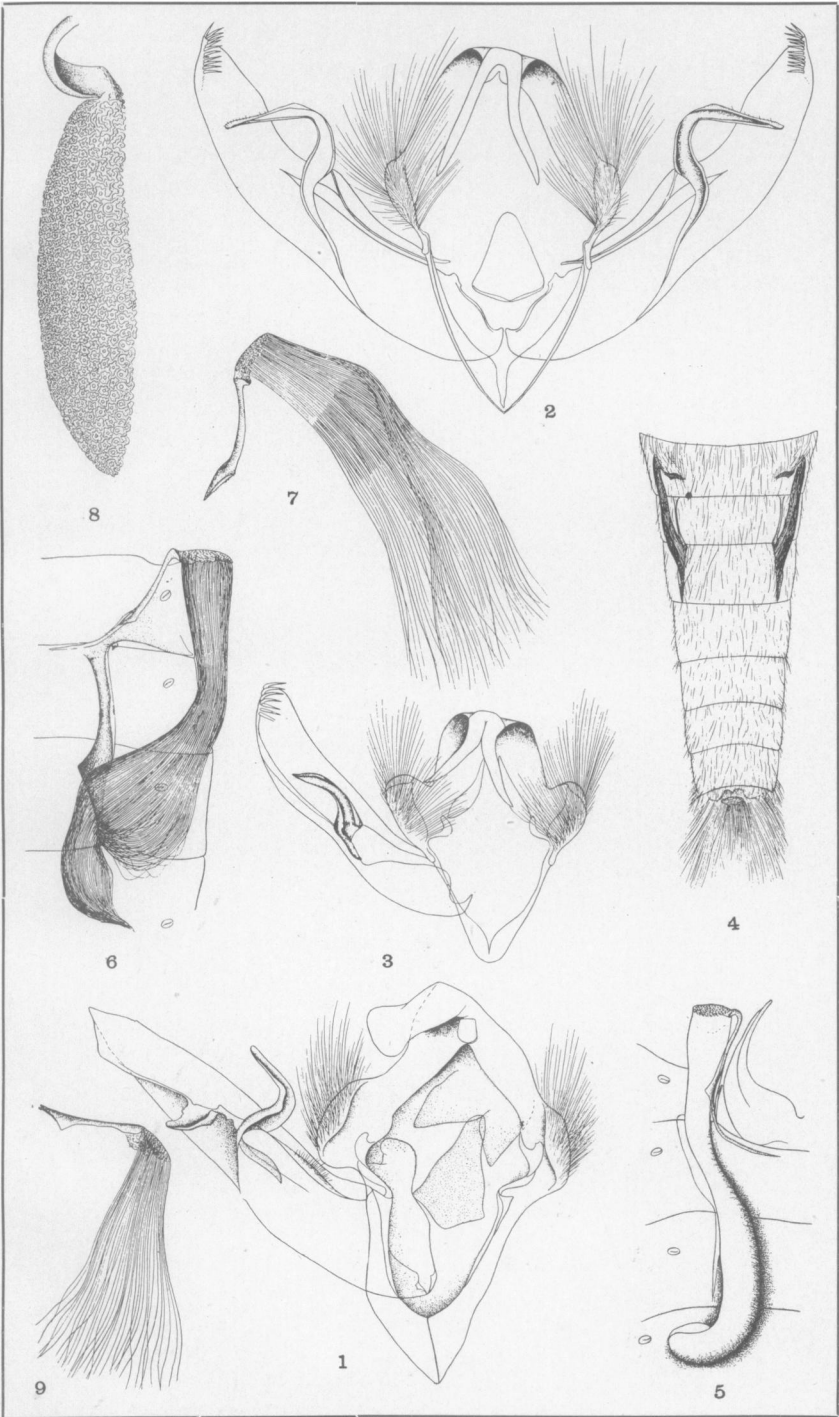
" *Orthosia ralla*, the hair pencil of male, separated from the abdomen.

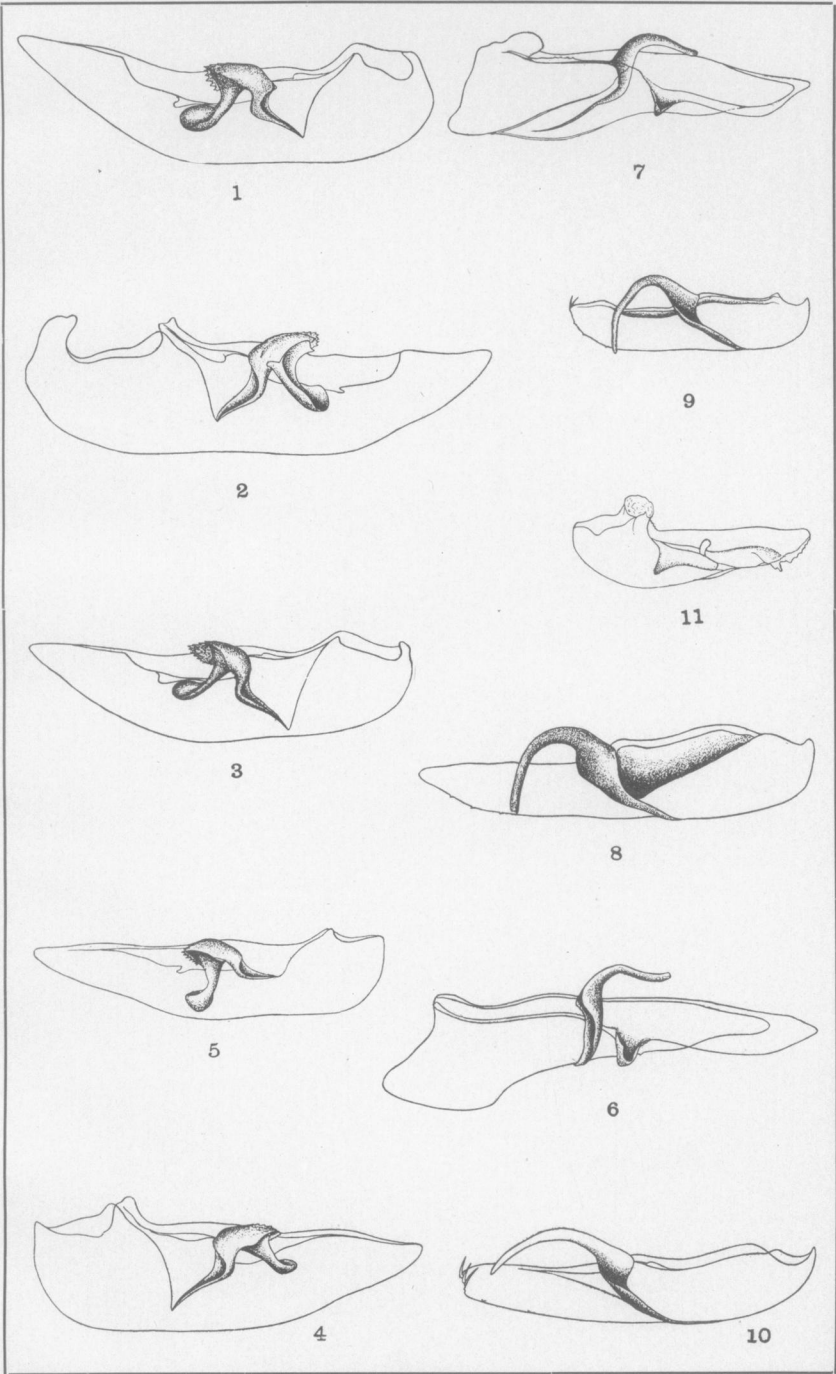
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##### PLATE X.

Fig. 1.—Harpe and clasper of male *Orthosia ferruginoides*.

" 2.—	"	"	"	"	<i>decipiens.</i>
" 3.—	"	"	"	"	<i>acta.</i>
" 4.—	"	"	"	"	<i>verberata.</i>
" 5.—	"	"	"	"	<i>straminea.</i>
" 6.—	"	"	"	"	<i>antapica.</i>
" 7.—	"	"	"	"	<i>fornica.</i>
" 8.—	"	"	"	"	<i>aggressa.</i>
" 9.—	"	"	"	"	<i>euroa.</i>
" 10.—	"	"	"	"	<i>duscata.</i>
" 11.—	"	"	"	"	<i>inops.</i>





SMITH ON LEPIDOPTERA.